

UNITED STATES PATENT OFFICE.

GEORGE B. GRANT, OF MALDEN, MASSACHUSETTS.

MACHINE FOR CUTTING SPUR AND WORM GEARS.

SPECIFICATION forming part of Letters Patent No. 405,030, dated June 11, 1889.

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To all whom it may concern:

Be it known that I, GEORGE B. GRANT, of Malden, in the county of Middlesex and State of Massachusetts, have invented certain
5 new and useful Improvements in Machines for Cutting the Teeth of Spur-Gears, of which the following is a specification.

My invention relates to certain improvements in machines for cutting either straight
10 or spiral teeth of spur-gears; and it consists in certain novel mechanism to feed a spiral cutting tool or hob across the face of the gear-blank being cut while both gear-blank and cutter are revolving together; and my invention
15 also consists in certain combinations of parts and details of construction, as herein-after set forth, and specifically claimed.

Figure 1 is a side elevation of a gear-cutting machine constructed in accordance with
20 my invention. Fig. 2 is a plan of the same. Fig. 3 is a vertical section on the line *p p* of Fig. 2. Fig. 4 is a vertical section on the line *x x* of Fig. 2.

In the drawings, A represents the standard
25 or frame which supports the machine. The horizontal gear-spindle B slides in its bearings in the standard A, in which it is free to move to a limited extent in the direction of its length. There is a strong spring *o* between the master-wheel and the standard,
30 serving to press back the gear-spindle B and to keep the blank C against the stop R. The object of this spring is to prevent any movement of the gear-blank when the cutter is being drawn outward, or movement from any
35 accidental cause. It carries the master-gear D at one end and the gear-blank C to be cut at the other end. The master-gear D is revolved by the pinion H, supported in suitable
40 bearings *s* and *t*. The gear-blank C bears against a rest R, attached to the standard A. This rest is preferably a friction-roller mounted on a vertical stud in the bracket S, whereby the gear-blank is permitted to revolve
45 freely while it is under pressure from the hob or cutter L. The bed F slides in vertical guides on the standard A and is moved on said standard and set in any desired position by the screw G, which works in the nut X, and
50 is turned by the hand-wheel E. The frame

I rests on the bed F and is suitably fastened on it at any small angle with the gear-spindle B, preferably by means of the bolt *h* in the slot *i* and the pivot-bolt K. The carriage J
55 slides on the frame I and is traversed on it by means of the feed-screw *k* and the nut *m*.

M is a head which is placed on the carriage J and forms a portion thereof, said head being fastened by the pivot-bolt *a* and the bolt *b* in the slot *j*, whereby it is made adjustable, and
60 can be fastened in any desired position.

In suitable bearings on the head M is mounted the cutter-shaft N, carrying the cutter or hob L, the said shaft and cutter being
65 revolved by means of the pulley Q, which is loose on the shaft N and drives it in one direction only by means of the ratchet O and the pawl P, whereby any accidental backward rotation of the cutter-shaft is prevented and
70 injury to the cutter or gear-blank thus avoided.

T is a grooved shaft, which is secured to the frame I by means of the bracket-bearings
75 *n* and *u* in such a position that it is parallel with the guides on which the carriage slides. The gear *e* is fastened on the head M by means of a bracket-bearing *f*, secured by the screw *g*, so that it may be adjusted when the head is moved on the carriage. The gear V is fast-
80 ened on the shaft N and meshes with the gear *e*. The gear *e* carries a spline which runs in the groove in the shaft T. The shaft T, by means of two pairs of worms and gears U and W and the shaft *q*, drives the feed-screw *k*
85 and slowly traverses the carriage J on the frame I. The grooved shaft T also drives the pinion H, with the shaft of which it is connected by a grooved shaft *d*, sliding in a
90 splined sleeve *c* and the universal joints Y and Z, the grooved shaft *d* and the splined sleeve *c* allowing for the vertical adjustment of the bed F. By thus connecting the gear-
95 spindle with the cutter-shaft I am enabled to communicate a positive rotary motion from the cutter-shaft to the gear-spindle, whereby the proper speed of the gear-spindle with relation to that of the cutter is at all times maintained. Furthermore, it will be seen that, on account of the described arrangement of
100 the grooved shaft T, the positive rotary mo-